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THE MUSHROOM GROWERS'
ASSOCIATION

MGA
BULLETIN

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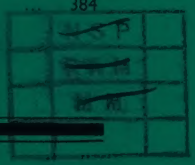

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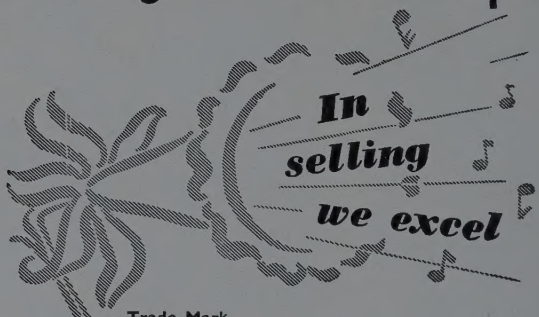

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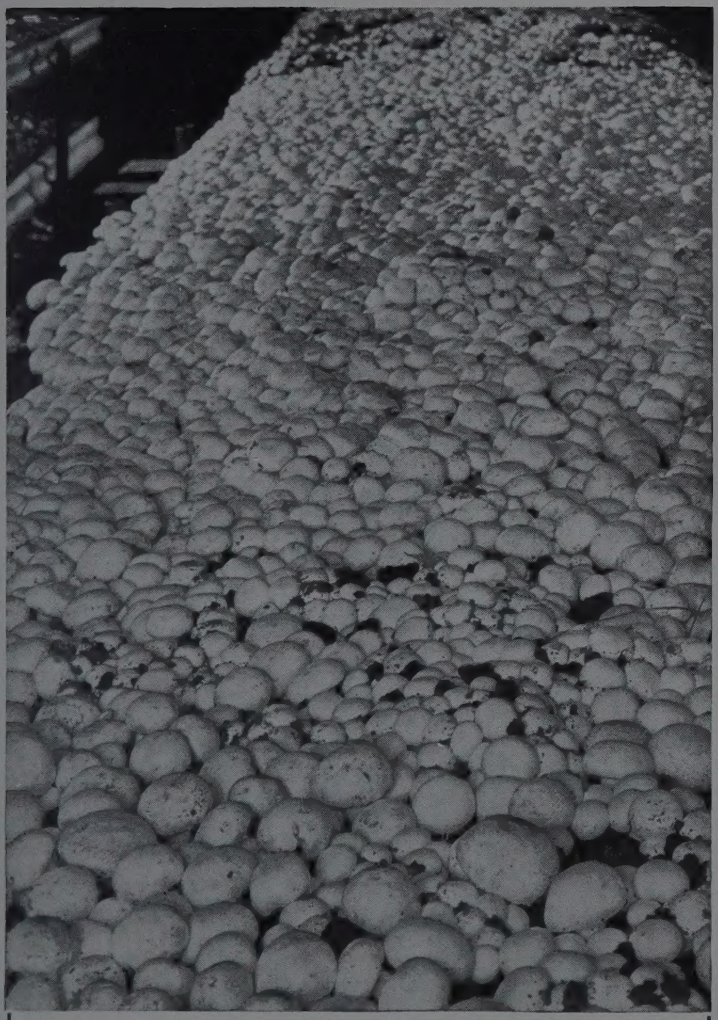

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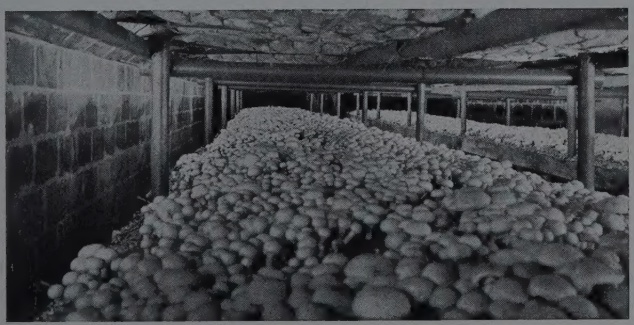

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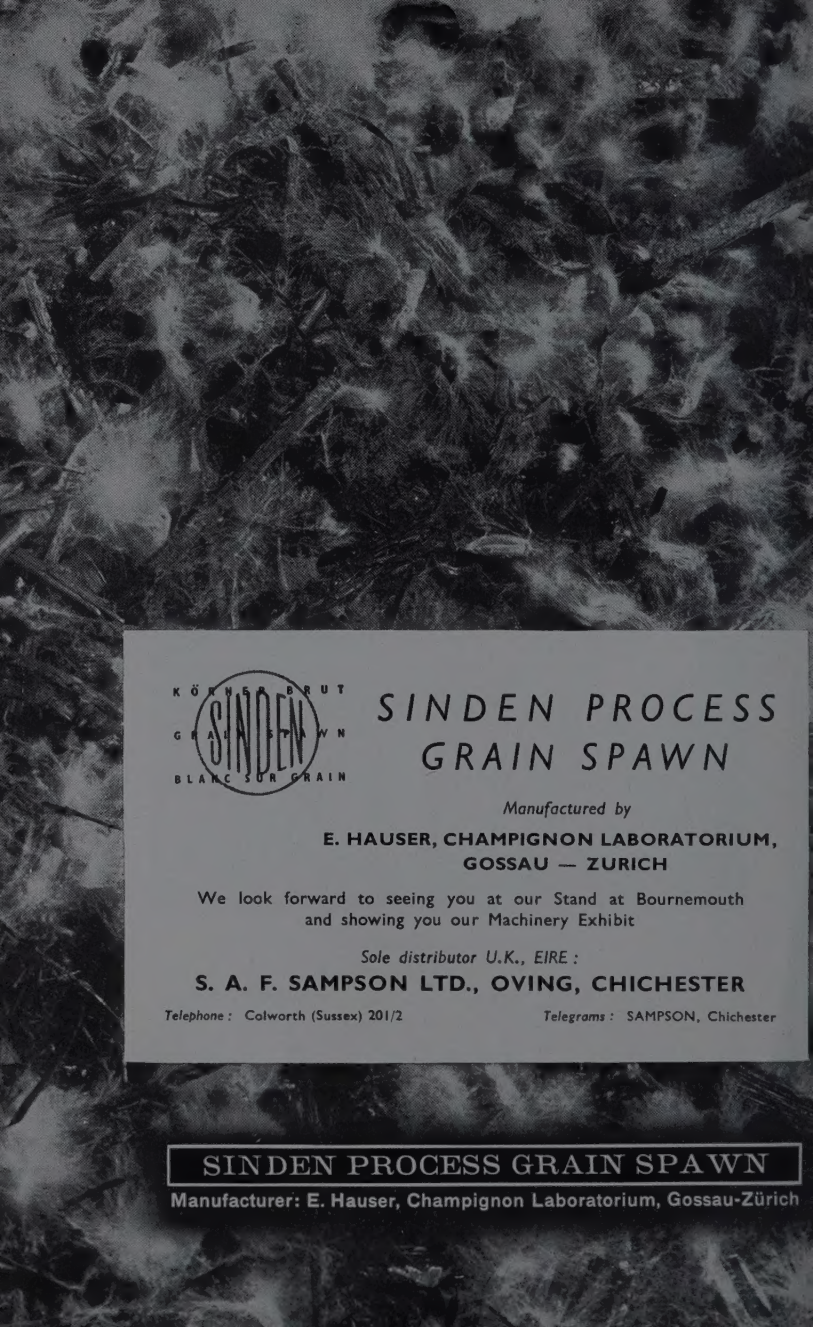

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EDITORIAL

BOURNEMOUTH WILL BE SO BRACING

It would not be true to say that, as far as mushroom growers are concerned, every road will lead to Bournemouth on the occasion of the Mushroom Industry Exhibition and Conference there on 1st and 2nd October. On the other hand it would certainly be true to say that the great majority of the progressive mushroom growers in the United Kingdom will certainly be there and many, unable to make the journey, will be there in spirit.

I do not think that any other section of the Horticultural Industry is so keen to discuss their problems with each other as are mushroom men, many of whom will cheerfully carry on, not only far into the night but far into the early hours of the morning as well.

Bournemouth then, offers the opportunity for discussion but it offers more, a chance to hear two outstanding mushroom personalities, one from America and one from England, each a first-class lecturer, each fully equipped to put over the full total of their own knowledge of the aspect of the industry with which they chose to deal. Each readily agrees that he is not master of the mushroom in all its ramifications for each knows that so much regarding the mushroom still remains to be discovered.

Bournemouth too provides a platform where the trade can meet the customer and where each side can discuss its own particular problems for, make no mistake, the problems of the mushroom industry are not by any means confined to the grower.

It is from discussions between grower and grower, and between grower and sundriesman, that knowledge is obtained and progress made and nobody will doubt that, as a result of Bournemouth and similar activities promoted by the MGA, a few further steps forward will be achieved.

WRA

Fred. Atkins reporting:

AMERICA'S 3RD SHORT COURSE

Dr. Leon R. Kneebone

The third Mushroom Industry Short Course at Pennsylvania State University from 23rd to 26th June was attended by 227 delegates and speakers from 17 States and 5 foreign countries, Canada, Spain, Denmark, Scotland and England. Organization was first-class, under Dr. D. R. McClay, director of short courses and Dr. F. C. Snyder, and the programme was arranged to cater for varying interests by Dr. Leon R. Kneebone, associate professor of botany and plant pathology and director of mushroom research at the College of Agriculture.

The official welcome was followed by a showing of the excellent film, "American Mushroom Industry". Here was evidence in colour that Guy Cordivano, of Kennett Square, and Louis DalleMolle, of Hockessin, are amateur photographers with the professional touch. We ought to have a copy in Britain.

Dr. Kenneth Morgareidge, of Food and Drug Research Laboratories, New York, spoke on "The Nutritional Value of Mushrooms". Americans are waist-line conscious, and low-calorie foods are sought to relieve the monotony of dieting; on a fresh weight basis, mushrooms

Dr. Leon Kneebone talks informally to a group of delegates (*Photo: Roca Dumora*)

supply 20 calories per 100 grams or 90 calories per pound. The Laboratories had confirmed that mushrooms are an excellent source of niacin and riboflavin and a significant source of pyridoxine, pantothenic acid and thiamine, in comparison with many other vegetables. Their content of biotin, vitamin B_{12} and folic acid were probably not significant.

" We would like to know more about the quality of the protein which is present," he went on. " Very little work has been found dealing with the trace mineral elements in mushrooms. We need to know more about the form in which iron is present. Some trace elements which might be important are copper, manganese, zinc, cobalt and others. A vast field for future work might be the improvement of the nutritive value of mushrooms by genetic selection of spawn."

Dr. Morgareidge ended by saying that fresh mushrooms, on the basis of their known nutrient content, deserved a respected place in the well balanced diet for their positive contribution of nutrients over and above their value by adding flavour and zest to other foods. Their importance should not be minimised, for " good digestion waits on appetite " and, regardless of all that might be good for him, modern man still preferred to eat what he liked best.

A plea for more information on production figures, quantities processed and movement through the fresh markets was made by W. A. Lee, professor of marketing, Penn. State, and L. E. Fouraker, professor of economics, in their paper on " Pricing in the marketing of mushrooms." Keeping such information secret would not lessen the impact of Supply and Demand forces on the price level, they said; many factors could cause price changes and changes in supply and demand themselves, such as the economic state of the country and new fads in diets.

Mr. F. Bleazard, MGA Chairman, seen with Mr. Adam T. Spinka, President of the Temple Group of Mushroom Growers. Mr. Bleazard is making one of his two television broadcasts.

Dr. Ray C. Smith, associate professor of agricultural economics at Delaware, spoke of " Characteristics of the mushroom industry in Pennsylvania, Delaware and Maryland", which probably comprise 80 per cent. of the growers in the United States. The average size plant, he said, was 33,000 sq. ft. in South-eastern Pennsylvania, where there were 435 growers; this was equivalent to just over four "doubles", a standard double being 8,000 sq. ft. Of the annual production, 24% went to the fresh market, 59% was canned, and 17% was made into soup.

August/September was the principal filling period; it represented two-thirds of the area put down in the year. The remainder was filled in January/February.

Growing space per winter employee (i.e., per hired worker) had gone up from 13,000 sq. ft. in 1954/5 to 14,400 sq. ft. in 1956/7. And 58% of the compost used was horse-manure; the 39% of volume accredited to synthetic compost was increasing. (About 45% of the growers in the survey use synthetic.)

" Comparative costs of marketing fresh and canned mushrooms " was a study by R. L. Carey, graduate assistant at Delaware, based on 77 personal interviews. There was a definite correlation between labour costs and the size of a plant; as the size of plant increased they decreased. For the fresh market it cost six growers filling an average of 11,500 sq. ft. p.a. 17·3 cents/lb., nine growers filling 33,250 sq. ft. 8·9 cents, and seven growers filling 108,500 sq. ft. 6·7 cents. When the mushrooms went to the processors it cost 10 growers filling an average of 16,250 sq. ft. p.a. 9·8 cents/lb., 12 growers filling 40,500 sq. ft. 6·5 cents, and 12 other growers filling 90,000 sq. ft. 6·8 cents.

An interesting analysis of picking and packing costings per pound was presented:

	For the Fresh Market	*For the Processed Market*
Labour	8·0	7·1 cents
Packing materials	4·2	1·2
Commission, etc.	7·3	0·4
Interest, repairs, depreciation ..	0·6	0·1
	20·1	8·8

This little table met with a degree of dissatisfaction among the growers present, largely centred on figures presented for costs of growers who packed for both the fresh and the processed market, where the labour curiously was less than when one concentrated on one or the other market.

R. W. Arnold, of the Carrier Corporation, which is to air-condition the University's new mushroom research buildings, spoke on the theory of "Air conditioning the mushroom house ". He suggested that the best practice to date was to build out of wood, because aluminium was not altogether satisfactory; and all air, whether fresh or circulating, should pass through filters.

C. A. Keelen, of the Portland Cement Association, gave a pep talk on " Quality concrete and concrete masonry ", stressing throughout the importance of the proportion of water added to a sack of cement. For examples, concrete made with 5 gallons was 2½ times more durable in conditions of alternating freezing and drying than concrete made with 7 gallons, was one-third stronger, and was definitely more waterproof. " The water should be fit to drink, and the sand should be clean and well graded from fine to coarse, the concrete should be put down when the air temperature is around 70° F., and it should be kept moist for at least five days ", he concluded.

John C. Bovenkerk, director of research, Grocery Store Products, West Chester, presented two particularly interesting papers. In one, he spoke of " Mushroom crop yields and their relationship to nutrients as indicated by total nitrogen in the compost ". He was considering *total* nitrogen, without differentiation between forms of N (protein, etc.)

He did not suggest for one moment that nitrogen was the only important factor.

Research had tended to confirm Dr. Sinden's figures of 1·5% N as desirable, but it was not easy to come by. " Some years ago we used to get manure with 1·35% N, but now it is much closer to 1·10%" he said. Manure containing 1·10% N had produced 1·6 lb./ft. in a 70-day picking period, but when supplemented or " boosted " had done 2·1 lb. Manure with 1·35%N had given 2·0 lb./ft. and, supplemented, nearly 3·0 lb.

Growers should be on their guard against leaching from the stack Composts with 1·17%N had yielded close to 2 lb./ft. with a light " run off ", 1·55 lb. with a heavy run off, and 2·25 lb. when there was no run off. Supplementation was almost always desirable, but should not be excessive, for too much could completely suppress spawn growth through ammonification.

Yields could be increased, also, by putting more compost into the beds or trays. At a rate of 35 lb. compost/sq. ft., giving a depth of 4 inches, the yield in one set of experiments was 1·18 lb./ft. This rose steadily with the amount of compost employed, to 1·30 lb./ft. from 40 lb. compost, 1·87 from 45, 2·37 from 50, 2·75 from 55, 3·25 from 60, and 3·50 from 70 lb. (making an 8-inch bed).

In summary: Nitrogen is a good index of potential yield because when N is present the other organic materials required are usually present; if N is deficient, yield can be increased by supplementation; and greater depth of bed gave higher yields.

Mr. Bovenkerk (right) discusses a technical point with Dr. E. B. Lambert
Photo by F. C. Atkins

John Bovenkerk's other paper, entitled " Five common mistakes made by many growers that result in yield reduction ", gave us the other side of the picture. He spoke of the need, particularly in the early breaks, for " whole bed response ". Uneven cropping could result from:

(*a*) **Failure to provide materials capable of making a good compost.** Many growers did not or could not get material which gave a good response; while many had a good material to start with but failed to conserve its good qualities through the composting period.

(*b*) **Failure to fill the beds evenly.** Frequently it was noticed that there were areas which were filled deeply, and frequently there were shallow spots; and there were areas which were tightly packed and areas which were loosely packed.

(*c*) **Failure to achieve adequate peak-heat temperatures.** Also, there were still growers who did not provide adequate ventilation during pasteurization; perhaps the best rule of thumb was to give all the air possible, to the point where temperatures began to fall.

(*d*) **Failure to give proper treatment to the casing soil.** There were still quite a few growers who did not sterilize or pasteurize their soil. Sooner or later they would face serious economic loss. After sterilization some growers allowed the soil to become recontaminated; others went to all this expense yet never achieved what was intended. The soil should be used as soon as possible after treatment.

(*e*) **Failure to preserve the properties of the casing layer.** It was important to case to an even depth, for otherwise the mushrooms would not appear evenly over the bed, and some would die off. If there were deep areas, obviously the watering practice would differ from where the casing was shallow. Sealing of the soil layer occurred much more frequently than was believed or could be perceived. By making artificial cracks in an intentionally sealed casing he had got mushrooms at the first flush only in those cracks.

(*f*) **Failure to provide adequate sanitation.** This was probably the most glaring of all failures. It was simply good housekeeping plus. There were certain organisms, such as Truffle or Mat, which were not killed by " cooking out " at the end of the crop. Therefore spent compost, even after cooking out, should not be allowed to lie around or put on land close to the cropping houses. If you were using zineb to control Bubble, for example, you were wasting your time unless you applied it frequently enough; similarly, fly control measures must constantly be practised.

W. H. (Bill) Allision, graduate assistant in botany at Penn. State, reported on "Attempts to control bacterial blotch by antibiotics ". A wide variety of antibiotics had been tried against blotch caused by *Pseudomonas tolaasi*. In pure culture he had found aureomycin to be most effective, giving complete inhibition at 100 parts per million; but when he attempted to translate this finding to commercial practice it proved to be quite ineffective.

Dr. Eldrow Reeve suggested that, since the action of aureomycin was systemic, perhaps hypodermic injection might be tried before the idea of control by antibiotics was abandoned.

Dr. Lee C. Schisler, of the research department, Butler County Mushroom Farm, spoke on " The casing layer ". What was its exact function? Volatile products were given off, presumably by the mushroom mycelium. Dr. Lambert had reported on the effect of concentrations of carbon dioxide; other investigators had suggested there was another gas, possibly an unsaturated hydro-carbon which adversely affected the mushrooms. A good soil structure was needed for proper gas exchange to take place, for the mycelium required oxygen from the air, and gases respired in the compost needed to escape to the air; and the soil must be able to hold plenty of water.

There was a wide divergence of opinion on the correct interval between spawning and casing. Earlier-cased trays came into crop sooner than late-cased trays, but in some cases the late-cased had caught up and in others had overcome those cased earlier. The best moment undoubtedly varied with circumstances; 13 days had been found best at the University, while at West Winfield the optimum interval was 21 days. Earlier cased trays might be more suitable for short cropping periods, but the same interval would not apply on every plant. The condition of the compost, the depth of fill, and the temperature of the bed, were variables which had to be taken into consideration. As for the optimum depth of the casing layer, different soils required different depths. It was, in short, an individual problem.

Other papers were "Amino acids and carbohydrates ", by Dr. G. F. Somers, associate director, Delaware University Agricultural Experiment Station, and Donald H. Hughes, food technologist at the same University; " Washing and packaging mushrooms for the fresh market ", by Donald Hughes; " Importance of quality in market acceptance and price ", by Dr. R. K. Slamp, associate professor, agricultural economics extension Penn. State; " Report of merchandising studies at Penn. State ", by Professor H. Bruce Bylund, assistant professor of rural socialogy; " Market development for canned mushrooms " by Jack R. Grey, secretary-treasurer of the Mushroom Canners League; " Four ways to sell mushrooms ", by R. Knox, of Knox, Kornfeld and Smith; " Building and maintaining of good soil properties", by J. H. Eakin, Jr., Associate professor, agronomy extension, Penn. State.

I presented two papers. The first, on " The general structure of the mushroom industry in Great Britain ", merely gave the delegates my ringside view of the staggering revolution which has taken place over the past decade. There was particular interest in our use of peat as a casing material.

Much less dull, I think, was my second paper on "Major problems in production and merchandising faced by growers in Great Britain ". I pointed out that the pace of mushroom growing had been accelerating steadily for some years, and that I at any rate had been slow to realise that, the faster the mushroom grew, the more air it needed and the heavier the concentration of metabolic by-products to be removed.

" The general failure to provide enough air (but not too much) at the right moments, at the right speed, temperature and humidity,

Laboratory demonstration during the course.

has led in the past year or two ", I suggested, " to an upsurge of disorders variously diagnosed or at least described as Brown Disease, Watery Stipe and La France Disease. I am not alone in believing that (*a*) one or more infective agents exist, and (*b*) the climate in the house and in the bed has a profound influence on the development of these disorders."

I spoke of our efforts to prevent Mat Disease, of the pressing need for more spawn research, and of Littlehampton's work on Cecids and Phorids. I left myself little time to discuss merchandising, purposely, because we are so far behind the States in this field ; we have done no market research at all comparable with theirs.

Dr. Kneebone gave the final paper on " Clarification on certain wild mushrooms in the news ". There had been a lot of unnecessary worry, he said. " I don't mean that we should not be alert to potential competition. In recent years there was a scare about submerged culture of they mycelium of our mushroom; we have heard nothing more about it. Dr. Humfeld worked for seven years with a team in California trying to get some flavour into mushroom mycelium, but the process did not attract sufficient attention to be put into commercial practice.

" Much more recently there has been a lot of publicity on the mycelium of the Morel. It is not a mushroom and it cannot be marketed as a mushroom. The mycelium balls up into pellets in the aerated liquid medium.

" Then there has been anxiety about *Pleurotus ostreatus* grown on a sawdust-oatmeal compost. But the compost must be sterilized; this

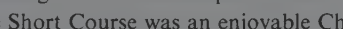
is very costly and an absolute necessity, for the Oyster mushroom is extremely vulnerable to competitors our mushroom can live with."

After these comforting words Dr. Kneebone spoke amusingly of hallucinatory fungi, particularly those from Mexico, and the Course came to a happy close.

There was a magnificent educational exhibit in the Buckhout laboratory staged by Dr. Kneebone and Mrs. Perrina Shultz, his mushroom laboratory technician. It must have taken them months of hard work and collecting to assemble the 50 microscopes, each with a slide of a different mushroom pathogen, weed mould, indicator mould or competitor, as well as to provide pure cultures, disease specimens, and photographs of most of the disorders.

Professor C. Aubrey Thomas, the entomologist at Penn. State University Laboratory, Kennett Square, whose sketches of mushroom pests are known throughout the world, has prepared new drawings which are shortly to be published. They were on view in the Frear building, and Thomas there discussed problems of pest prevention and control on two afternoons. He was unable to add to our limited knowledge of Cecids, referring us to Littlehampton's work.

Incidental to the Short Course was an enjoyable Chicken Barbecue in Hort Woods on the Tuesday evening, and a display of equipment in the Stock Pavilion which included the Farnco aluminium conveyor for filling shelves, the AEC mushroom root and stalk cutter, Ronjonite washes and the Cesco automatic mushroom washer.



MGA PROCESSING PROPOSALS

Members will recall that certain proposals relating to the processing of inferior quality mushrooms are under consideration by the MGA Executive Committee following a decision at the adjourned annual meeting that the matter should be thoroughly investigated.

Your Executive Committee, at its last meeting, decided that this investigation should be undertaken forthwith and, within the next day or two, all Grower Members will receive a questionnaire which they are asked to fill in.

It is of the greatest importance that this survey should be completed in every possible detail in order that your Committee, equipped with this vital information, can thoroughly study the whole matter and arrive at a true assessment of the overall position in order that the Committee can make definite recommendations, one way or the other, for the further consideration of all Grower Members.

All Grower Members are therefore urged to complete the form and return it as soon as possible to the MGA Secretary. The information supplied will remain strictly confidential.

Remember that this investigation is being carried out for your possible benefit; your part in it, at the moment, is to fill in the questionnaire. If you fail in this then the whole investigation must fail. The issue is as simple as that.

DR. LEON KNEEBONE FOR BOURNEMOUTH

There is splendid news for MGA members intending to be present at the Mushroom Industry Exhibition and Conference at Bournemouth on 1st and 2nd October. Dr. Leon Kneebone, Professor of Botany and in charge of mushroom research at Pennsylvania State University, U.S.A., is to join Mr. Fred. C. Atkins in giving a lecture during the conference.

At one time it seemed certain that Dr. Kneebone would be unable to make the trip but, following the visit of Mr. Atkins to America recently, the earlier plans for Dr. Kneebone's visit were re-opened, with the result that the trip is now definitely on.

With Dr. Kneebone now lecturing on the afternoon of 1st October, and Mr. Atkins on the afternoon of 2nd October, plus the full support which is being given to the Exhibition and the Conference by the Trade in general, the success of Bournemouth is now assured and a good attendance of growers certain.

It is a matter for some misgiving that the only available room for the lectures is somewhat smaller than needed and, in view of this and the widespread interest which is bound to be taken in the lectures, the Exhibition Sub-Committee have, not without reluctance, had to limit the attendance to 150. **Admission will be by ticket only with one ticket, at 5/- each, admitting the bearer to both lectures.** Owing to this space limitation MGA members only together with partners in their business, will be allowed tickets and applications for these **must be received not later than 20th September.** After that date any remaining tickets will be available to members, for use of members of their staff, strictly on the first come first served basis. Members are therefore strongly advised to make application without delay, if they have not already done so.

Everyone connected with the organisation of this Conference and Exhibition is hoping that the mushroom competitions, judging of which is timed to commence at 2.30 p.m. on 1st October, will once again be fully supported.

A new departure at Bournemouth is the calling of a special meeting of members, for the purposes of a general discussion, after the presentation of the mushroom competition trophies and the window dressing prizes in the Grand Hotel Ballroom on Wednesday evening. His Worship the Mayor of Bournemouth has kindly consented to make the prize presentations.

Always popular since its innovation is the "get together" of members on the eve of the Exhibition and Conference and this will again take place this year at The Grand Hotel, headquarters of the MGA.

Identification badges will be issued to all MGA members between 8 p.m. and 9.30 p.m. at the Grand Hotel, on 30th September, and it is absolutely **essential** that any member who intends to be present but who does not apply for a lecture ticket, should inform the MGA Secretary accordingly and at once. After the final lecture on 2nd October the badges should be returned to the MGA Stand in the Exhibition Hall.

Tuesday, 30th September

9 p.m.	" Get Together ", Grand Hotel—to talk mushrooms and buy other members drinks.

Wednesday, 1st October

10 a.m.—6 p.m.	Mushroom Industry Exhibition, Town Hall.
2.30 p.m.	Mushroom Competition Judging, Town Hall.
3—4.30 p.m.	*Lecture:* DR. LEON KNEEBONE, Professor of Botany—in charge of mushroom research at the Pennsylvania State University, U.S.A.
6.30 p.m.	Presentation of Competition Cups and Window Dressing Competition by HIS WORSHIP, THE MAYOR OF BOURNEMOUTH, Ballroom, Grand Hotel.
8.45 p.m.	General Meeting-Discussion, Grand Hotel Ballroom.

Thursday, 2nd October

10 a.m.—6 p.m.	Mushroom Industry Exhibition, Town Hall.
3—4.30 p.m.	*Lecture:* FRED. C. ATKINS, Chairman of Noble Mushrooms Ltd., President of the International Commission on Mushroom Science and Chairman of the MGA Research Committee.

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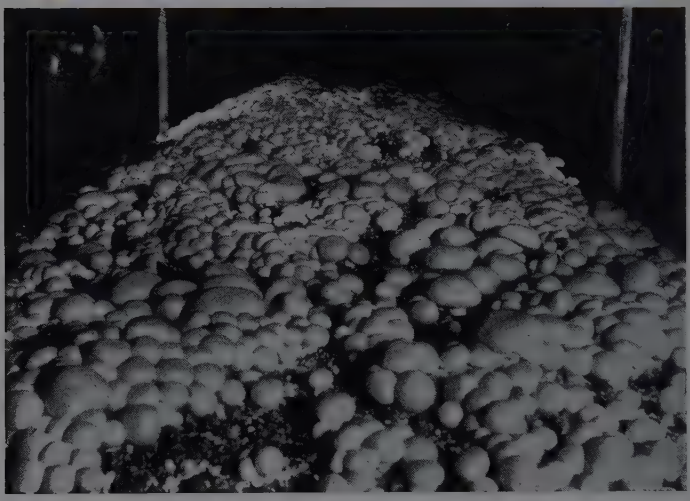

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INSECTICIDES

Insecticides to-day are complicated chemical products and new ones appear with increasing frequency, e.g., two new ones which are not in common use but may be useful are Bayer's " Deptreex " and Shell's " Phosdrin ". And although their use has brought great changes to mushroom growing, it is probably true to say that they are the commonly used tool of which least is known. These insecticide articles are a basis for, and clearing ground of, the disconnected and jumbled facts which we mostly have.

Although an attempt has been made to cover all aspects of insecticides, it will almost certainly show gaps more noticeable to some than myself, and I hope this will lead to further discussions in these columns.

E.P.*

*The Editor is grateful to Mr. Palfrey, both for his contributions on insecticides and for getting together the other papers.

INSECTICIDES AND POISONING

By **E. Palfrey**

Designed to be poisonous to insects, all insecticides have measurable toxic effects on human beings. To give some idea of the relative toxicity of insecticides mushroom growers use, and some they don't, below is listed the dose which will kill half a test group of small animals, usually rats, in figures milligrammes of the pure substance to a kilogramme body weight of the animal:

*TEPP	2
*Parathion	3·5-10
*DNOC	7-10
Nicotine	10
DDVP (Phoracide)	30
Aldrin	40
*SDNOC	40-65
BHC (gamma)	125
DDT	115-225
Diazinon (Basudin)	75-250
Malathion	1,000
Pyrethrum	200-1,500

This provides us with a starting point in understanding the danger which a particular insecticide might present. The figures above are for oral administration and some illustrate the range of values found by different workers. Further, if applied other than orally, the amount necessary to kill half a test group would generally be different. In the same way, the danger from an insecticide may be more or less than is implied by the table above because of the way it is applied or the formulation it is made up in. It would be well to note that the above is a table showing toxicity, and that toxicity is the ability of a material to cause harm, whereas the health hazard is the probability that it will do so. Chemicals which are not considered very toxic used carelessly have caused harm, while more poisonous materials have been handled with care and caused no harm. As to formulations, it may be noted that a wettable powder used for spraying contains a high percentage of the insecticide and is more dangerous than the powders used for dusting.

In this connection it may be noted that we tend to think of poisoning as taking place through the mouth, by eating or inhaling. But absorption through the skin is largely unrealised as a danger. Aerosols, solutions of the chemical in an organic liquid, if splashed on the skin soak in quickly, and being concentrated, carry considerable amounts of the chemical into the body. Another hazard which may not be realised is that the absorption or its effect is greater when temperatures are higher, and in this connection it may be noted that the deaths from DNOC type preparations have all occurred when temperatures were in the 70's.

When in the body organo-phosphorus insecticides, for example, inhibit the action of the enzyme cholinesterase, as they do in insects. They often have an accumulative effect, in that repeated small doses at short intervals will eventually kill. In this event, the symptoms of illness may not appear until a dangerous amount has been absorbed.

So much for their poisonous nature. As far as safety is concerned, this is provided by following the instructions issued with the insecticide, generally on its container. There are some chemicals the use of which is subject to Statutory Regulations with which employers must comply. These are the most poisonous chemicals. The precautions to be taken with these must be given by the firm marketing the chemical with the insecticide when it is sold. Concerning the less poisonous chemicals, British firms who market them have agreed with the Ministry of Agriculture, Fisheries and Food, through their trade association on precautions to be taken, and these are given with the sold insecticide. It cannot be stressed too strongly that the precautions should be followed in full, however innocuous the material may look.

*Subject to Statutary Regulations made under The Agriculture (Poisonous Substances) Act, 1952.

APPLICATION OF INSECTICIDES

Formulations of insecticides and fungicides can be divided into four main classifications :—

Aerosol Concentrates,
Emulsions or water-soluble concentrates,
Wettable Powders,
Dry Powders.

Aerosol concentrates are becoming increasingly popular for they are both more economical and have a greater ' knock down ' effect than other formulations. They are expensive and therefore should be used at the correct rate of application and by means of a suitable equipment that will give the very fine droplet size necessary if full advantage of the lethal effect is to be gained.

For correct application, some form of compressor must be used giving an air pressure when the trigger is pressed, of **at least** 30 lb. per square inch. The most widely used form of projector is an equipment based on a paint sprayer. The high-pressure stream of air is directed over a fine jet, through which the concentrate is sucked, by way of a vacuum tube running down into a reservoir of concentrate.

While it is possible to use a paint sprayer with a sufficiently fine jet, coupled by high-pressure hose to a cylinder of compressed air, such an improvised set-up, although cheap and independent of electrical power, is unwieldy to use. For smaller growers, the P.B.I. or Sparklet Aerocide Projector is inexpensive, and uses for its supply of compressed gas, the metal bulbs " Sparklets " used for soda-water syphons. This projector however, is small and has a capacity of only one fluid ounce of concentrate ; consequently it may be necessary for the operator to recharge the projector half-way down the average-sized mushroom house to complete his task, or to use two projectors.

For the larger farm, an air-compressor is necessary and there are a very large number of models to choose from. In selecting his equipment the grower should bear in mind its portability, for it will be necessary either to carry or wheel it the length of the house, and reliability, because it is an item he will not wish to duplicate, and a breakdown might come at a time when he is taking intensive control measures. It would be unfair to name any particular compressors available to growers, in view of the very extensive choice offered to him by industry.

Emulsions and water-soluble concentrates are diluted by water to give a large volume of material at a low dilution. They are applied through sprayers, and the droplet size is very much larger than with concentrates, for the object is to cover the surface in contrast to filling the air with a fine suspension of active material.

There are three main varieties of sprayer ; the large machine, power operated, in which a mechanical pump maintains the pressure of the spray material to the nozzles ; the equipment in which air pressure is built up in a tank to force the material along the spray lines ; finally there is the hand-operated sprayer, usually of the knapsack variety, in which the operator pumps the sprayer as he sprays.

Of the larger machines, the Cheshunt Sprayer is powered by a 1½ h.p. Lister engine, and has a tank capacity of 45 gallons. The double-acting piston pump gives up to 150 lb. pressure when two twin-nozzle spray lances are in use. The " Hypermicrover " Sprayer is rather smaller, with a 1½ h.p. Villiers engine and 22 gallon tank.

In the second type of sprayer, the motive force behind the sprayer is compressed air, introduced into the tank either by a manually-operated pump (which can be integral with the tank) or by coupling the tank to a compressor. Nearly all these sprayers are in the form of a knapsack, worn on the back leaving the hands free to operate the trigger lance. Makes in common use include the Waverley range which has an integral pump, the Mystifier range, and the Leo-Colibri. Tank capacities run from 1½ to 3 or 4 gallons of dilute spray.

The third type of sprayer includes the small piston pump, the knapsack sprayer and the larger varieties where the pump and tank are mounted on wheels. In each variety the operator uses one hand to operate the pump while directing the spray lance with the other. Sprayers of this type include the Eclipse Knapsack Sprayer, Mysto Knapsack Sprayer with tank capacity from 1½ to 4 gallons, and, mounted on wheels, the Winchester and Shrewsbury Sprayers with much larger tank capacities.

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Generally speaking, all these sprayers can be used to spray most of the common materials in use in the mushroom industry. The lances have interchangeable nozzles to allow the grower to cope with fluids of differing viscosity. Where spray material is corrosive, as with copper sulphate, special spray tanks can be obtained that will not be attacked by corrosion.

Wettable powders can be applied through the above-mentioned sprayers, although coarse nozzles will usually be required. It is important to realise, however, that a wettable powder forms a suspension in water, and therefore the spray liquid must be agitated continuously to maintain the same density of material throughout the spray. Most manually-operated sprayers contain an agitator that will do this automatically as the operator pumps, but in the case of the pneumatic sprayers there is a risk of the powder settling to the bottom of the tank if it is left standing for any length of time.

For dry powder dusting, the grower has a choice ranging from the small hand dusters of the Acme and Waldron type, to power-operated machines such as the Darlington Electric Duster or the Mysto-Hart Duster which is carried on the back and is powered by a petrol engine. While some form of electrical or mechanical powered duster is essential on large farms, many growers use the hand powered rotary blowers such as the Early Bird, the new Armada or the Mysto Powder Blower, all of which are carried by means of a harness.

P.B.I. Aerocide Projector	Pan Britannica Industries, Ltd., Waltham Abbey, Ex.
Cheshunt Sprayer	W. Darlington & Sons Ltd., Worthing, Sussex.
Hypermicrover	Cooper, Pegler & Co. Ltd., Burgess Hill, Sussex.
Waverley Pneumatic Sprayers	Eclipse Spraying Co. Ltd., Bearwood, Birmingham.
Mystifier Pneumatic Sprayers	Drake & Fletcher, Ltd., Maidstone, Kent.
Leo-Colibri Sprayer	Cooper, Pegler & Co. Ltd., Burgess Hill, Sussex.
Eclipse Knapsack Sprayers	Eclipse Spraying Co. Ltd., Bearwood, Birmingham.
Mysto Knapsack Sprayers	W. T. French & Son Ltd., Mysto Works, Birmingham.
Winchester Sprayer	W. T. French & Son Ltd., Mysto Works, Birmingham.
Shrewsbury Sprayer	W. T. French & Son Ltd., Mysto Works, Birmingham.
Darlington Electric Duster	W. Darlington & Sons Ltd., Worthing, Sussex.
Mysto-Hart Duster	W. T. French & Son Ltd. Mysto Works, Birmingham.
Early Bird Rotary Blower	W. Darlington & Sons Ltd., Worthing, Sussex.
M.D.G. Motorised Dust Gun	Drake & Fletcher Ltd., Maidstone, Kent.
Mamba Combined Atomiser & Duster ..	Drake & Fletcher Ltd., Maidstone, Kent.
Mysto Powder Blower	W. T. French & Son Ltd., Mysto Works, Birmingham.
Sparklet Protector	Sparklets Ltd., N.17.

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CONTROL OF FLYING INSECTS IN MUSHROOM HOUSES

Dr. N. W. Hussey
Glasshouse Crops Research Institute

At the outset I must stress that discussion of improvements in the techniques for pest control in mushroom houses is premature until more fundamental data on the effects of insecticides on population dynamics is available, but, having been prevailed upon to put pen to paper, I will attempt to suggest an approach to fly control which is developing in our minds as a result of our concern with the problem over the past two years.

The pests involved are **Phorids, Sciarids,** and **Cecids** and, generally speaking, the problem is rather different in each case. Cecids for instance rarely fly and yet it seems probable that numerous attacks are initiated by the flying adults migrating into the house, from outside. Of course this flying stage is only ephemeral and, once an adult has laid its complement of two or three eggs, reproduction continues by larval paedogenesis. On rapidly growing mycelium each larva will produce about twelve daughters in seven days so that a single adult Cecid laying eggs on the compost, soon after spawning, could give rise to a population of almost a million larvae in five weeks. These figures are, at first sight, astronomical but in terms of the population levels needed to affect cropping they are relatively small. The important factor is the size of the pest population relative to the quantity of mycelium present. Quite low populations assume considerable importance when the spawn is just starting to run, especially as we realise that the pests are strongly attracted to foci of rapidly growing mycelium. Cecids can also infest beds as larvae surviving inefficient hygiene methods so that control should guard against this possibility as well and it would appear that the incorporation of insecticide into the compost itself before spawning is the best safeguard. Preliminary experiments have shown that the insecticides commonly in use survive peak-heating and persist for some weeks after. The exact proportions to add are, at the moment however, rather vague as many materials do seem to delay cropping and we believe it to be most important to obtain data on the critical proportions for the most satisfactory insecticide as soon as possible.

In the case of Phorids access to the crop is almost certainly restricted to the flying adult which is strongly attracted to mushroom mycelium—the habits of the larvae are such that it is unlikely that they could survive normal hygiene practice. The population build-up is slower than in Cecids but observations on local farms suggest that, occasionally at least, a generation may be completed in seven or eight days at 70°F. in the spawn running rooms. In cropping houses one month is the more usual developmental period. A single female can produce about fifty eggs but in this species, unlike Cecids, there is a natural factor tending to depress population growth at the inception. The parasitic eelworm *Bradynema* which often attacks about 20% of the females and may in favourable circumstances infect 80%, tends to

make the mature female Phorids infertile. These facts combine to slow-up population growth so that a female would only produce on an average forty larvae to mature a month later. Serious difficulties are therefore only encountered when large numbers of females invade the houses to oviposit early in mycelial development. The females burrow down in the compost to oviposit so that it seems possible that if the compost surface could be rendered unattractive in the first few weeks following spawning, economic control would follow. Phorids are known to have developed resistance to a number of insecticides but of course attention has only been directed to the lethal ' knock down ' achieved by applications. We believe that Phorid females often lay their eggs in the compost, after emergence from the pupa, before they take flight so that the aerial fauna normally sprayed consists only of males and ' spent ' females. The problems is to reduce oviposition on newly spawned beds and, in the absence of information, it is possible that any insecticide with some repellent action on the Phorids may be effective and at Littlehampton we hope to study the effects of repellents which have been successful against biting-flies in cattle sheds.

The Sciarids, according to our preliminary observations, are of doubtful economic importance as there is evidence that they are not usually associated with damage to the mycelium by direct feeding. The possibility of harmful effects from the accumulation of toxic products deserves attention however. The classical damage to caps and stipes may only occur following some change in the environment, e.g., drying out of the compost ? It is certain however that considerable numbers of Sciarid larvae can be tolerated without depression of crop and we have some evidence that they do not favour strong mycelial growth. Once again population build-up is slow as development takes one month although each female can produce about 150 eggs. As with Phorids it seems feasible that if the populations can be kept down prior to pipping then economic losses will be negligible.

TABLE 1

Weekly Numbers of Phorids taken in the light trap

Week No.		Phorids
13		80
14	insecticide	49
15		151
16	insecticide	22
17		256

In conclusion one should remember that the number of flies present in the house in the later stages of cropping are, apart from cases of disease transmission (bacterial blotch), needlessly alarming. 1,000 sq. ft. of beds can carry populations of several million larvae without necessarily impairing production. Further our experience of spraying insecticides as reflected in the light trap catches is illuminating. Table 1 illustrates the sequence of events in a typical case from which it will be observed that although the ' knock down ' effect was good the population resumed its logarithmic growth the following week by virtue

of the large numbers of larvae maturing in the compost.

What are the conclusions developing from these biological considerations? Almost all insecticidal effort should be directed to the period immediately following spawning and until further information is available on the actual techniques two points seem unquestionable (*a*) insecticides should be put in the compost at the last turn and (*b*) during the spraying and smoking programme special attention should be paid to the bed surface to obtain the maximum repellent effects of the insecticides used.

HOW INSECTICIDES WORK

By **W. H. Read**

Glasshouse Crops Research Institute, Worthing Road, Littlehampton

Most modern insecticides, and particularly those at present applied by mushroom growers to control flies, can be included in two main groups—organo-phosphorus insecticides and chlorinated-hydrocarbon insecticides.

Diazinon, malathion, parathion, ' Phoracide ' and ' Metasystox ' are examples of the former group. Although there are differences in the chemical and biological properties of these compounds their ultimate toxic action is the same.

DDT, BHC, aldrin, dieldrin, etc., are included in the second group but the differences in biological properties between DDT, BHC and the other members of the group are sufficiently great to make such grouping misleading.

There are also several minor groups of insecticides such as organic thiocyanates, dinitrophenols and carbamicesters which, with the exception of DNC, a member of the second of these groups, have not so far been found of value to mushroom growers. In addition there are many miscellaneous insecticides both of vegetable origin, e.g., nicotine, pyrethrum and derris, and purely synthetic, e.g., cyanides, fluorine compounds, etc.

It is interesting to consider why a chemical may be highly poisonous to certain insects and not very effective for the control of others.

In general an insecticidal compound causes the death of the insect by interfering with a vital chemical change within the insect. In living organisms the change from one chemical substance to another is usually effected by minute amounts of other chemicals termed enzymes, and most insecticides kill the insect by stopping these enzymes from functioning. For example, organo-phosphorus compounds inhibit the action of the enzyme cholinesterase which is necessary for the functioning of the nervous system.

If a species of insect does not contain the enzymes with which a specific chemical interferes it is probable that the chemical will not be of value in controlling that species.

Even though the insect must make use of a particular enzyme system in order to survive, it may be comparatively resistant to a chemical which is very potent in preventing the functioning of that enzyme, for in practice the chemical may fail to reach the site at which the enzyme acts.

Such failure may be due to the inability of the chemical (insecticide) to penetrate the protective coating, i.e., cuticle of the insects's body; to it being broken down to non-poisonous products within the insect before it reaches the site at which it should exert its action; or possibly to it being absorbed by some part of the insect from which it may be released too slowly to seriously affect the insect.

These considerations apply equally where the compound is ingested by the insect, and the walls of the gut instead of the cuticle are the site of absorption.

Some organo-phosphorus compounds, e.g., pure parathion, schradan, etc., have little effect on enzymes such as cholinesterase until changed within the insect or plant to active inhibitors. This process takes place in both susceptible and non-susceptible insects. Theories to explain non-susceptibility under such conditions are conflicting and too involved to describe in a short article.

Nearly all workers investigating the penetration and mode of action of insecticides have used comparatively large insects in their experiments and there is as yet very little fundamental information about the insects which are of importance to the mushroom grower.

Dr. Hussey and Mr. Wyatt of the Glasshouse Crops Research Institute have observed that the nature of the cuticle of cecid larvae, which are resistant to DDT, appears to differ from the cuticle of certain other fly larvae susceptible to DDT, and it is possible that the cecids will be found resistant to other chemicals which are toxic to larvae of many other species of flies.

Certain other fly larvae are resistant to DDT applied to them externally but are highly susceptible to DDT injected into them. There are no simple artifices which can be used to increase the permeability of insecticides into insects—it is more profitable to search for insecticides which by virtue of their physical and chemical properties are able to penetrate.

The breaking down within the insect body of an insecticide to very much less insecticidal compounds is a most important factor because differences within a species in the rate of such breakdown are responsible for resistant strains. The development by normally susceptible insects of strains resistant to the action of insecticides has long been known. There are in existence resistant strains of many insects and mites, and resistance is shown towards very many chemicals including hydrogen cyanide and arsenic.

The widespread use of newer insecticides has resulted in the appearance of resistance in many species of insects and mites. The problem has been most investigated in connection with resistant houseflies. Evidence has been published showing that DDT resistant flies are able to speedily change absorbed DDT into a non-toxic metabolic product, whereas non-resistant flies do not possess this power. Similarly

a strain of BHC-resistant flies can detoxify BHC much more rapidly than normal, susceptible strains.

The larvae of a strain of house flies resistant as adults to DDT appear able to metabolise DDT faster than non-resistant larvae. Similar effects are responsible for BHC resistant strains. The larvae are, in any case, less affected by DDT than the corresponding adults.

Current theories suggest that resistant strains arise through the insecticide killing all but naturally occurring *mutants* having factors conferring resistance, rather than resistant mutants being produced by an interaction between the chemical in sub-lethal doses and the insect.

A mutant is a variant which has arisen in a species through a change in genetical ' make-up '. It carries a changed or new heredity factor (gene) which alters the processes governed by it within the organism.

Resistant strains are selected most effectively by breeding larvae in media containing the insecticide and this may be a danger where insecticides are incorporated in the compost.

Once a resistant strain has been developed it usually remains resistant after contact with the insecticide has ceased.

It cannot be foretold whether the use of a specific insecticide against a pest is likely to result in the appearance of a resistant strain of that pest.

Resistance to an insecticide belonging to one group of insecticides is not usually accompanied by resistance to insecticides in other groups but it is frequently accompanied by resistance to other compounds in the same group.

Thus resistance initially developed by houseflies towards BHC (lindane) is apparent towards dieldrin, aldrin, chlordane and other members of the group but not always appreciably towards DDT.

With insects, the greatest degree of resistance appears to have developed with chlorinated hydrocarbon insecticides, with mites most resistance has developed towards organo-phosphorus compounds.

The main safeguard against the production of resistant strains is to ensure that whatever insecticide is used against a specific pest, it shall be so used that the minimum number of insects and particularly their larvae, survive through inadequate dosage or distribution.

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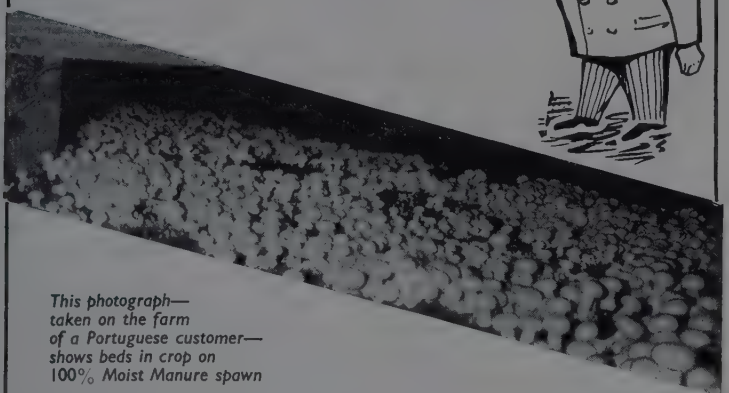

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GOING TO BOURNEMOUTH?

If you are going to the Mushroom Industry Exhibition at Bournemouth, on 1st and 2nd October, make a call at Stand No. 15 and discuss your insurance problems with a representative of the National Farmers' Union Mutual Insurance Society Ltd. Why not check your existing premium rates with those the NFU Mutual can offer? You might well be able to save yourself a tidy sum of money each year.

WORLD'S PRESS DIGEST

Mushrooms have to be pushed (*Grower*, June 21/58). **Prices** are the lowest for a very long time; in fact the average price has not been good since January (*Grower*, June 28/58). Mushrooms go from bad to worse (*Grower*, July 5/58). Mushrooms have taken a lower plunge in price, with poor quality Irish upsetting the home-grown by a retail price of 3s. per lb. This barely covers the cost of local production (Cheshire correspondent in *Grower*, July 12/58). A firmer inquiry this week, particularly for outstanding cups (*Fruit Trades' Journal*, July 19/58).

" I can sell all the mushrooms in my shop for **1s. a quarter** ", said a retailer in Brentford Market, " but, if they go over that, demand is down by more than 50 per cent. . . . If the housewife can get tomatoes for 1s. per lb. or eggs at 3d., you don't sell so many mushrooms ".*

H. G. Schaffer in *Grower*, July 19/58.

**What did I say last month?* FCA.

A grower referred to the dark interiors of mushroom houses generally, and how **colours** on walls, ceilings and structures could have an effect on insects, workers and possibly the mushrooms themselves. It is well known that a blue ceiling appears to be further away than a red one, and that yellow is to some extent an insect repellant.

Robert Patterson in *Commercial Grower*, July 11/58.

We have had a flood of telephone calls and letters from mushroom growers about an article in the London *Evening News* telling the success story of Wing-Commander Stanford Tuck, who turned from being a flying ace to raise mushrooms. The indignation is colossal—particularly over the headline, which read: £60 a week if you've got the gift . . . Rumours of a big **new mushroom venture in the Midlands** are not raising any cheers, either. But perhaps this will not now come off.

Grower, July 19/58.

Expansion continues to-day at an uncomfortable rate. Our only salvation lies in the fresh market with the new methods developed by the University of Delaware in the **washing, grading and packaging** of our mushrooms. Vincent A. Leo in AMI's *Mushroom News*, June/58.

Faced with a need for more outlets for their increasing agricultural production, **France** will be participating for the first time at the British Food Fair which is to open at Olympia in August. They will be attempting to popularise some of their lesser known products such as mushrooms . . . *Commercial Grower*, July 11/58.

A useful **hose coupling** that eliminates the need for permanent fittings on the end of the hose is manufactured by Airtech Ltd., of Haddenham, Bucks. One of these couplings, which are made of nylon, can be fitted securely to the end of an unprepared hose by hand, and removed as often as required. *Control*, July/58.

Four years of experimenting with **dried mushrooms** by Mr. Ron Jon Annaballi, of Temple, Pennsylvania, has led to several interesting new products. Dehydrated mushrooms, flaked, sliced and whole, are three of the easy-to-use forms. There's a seasoned salt in a shaker jar; and cocktail mushrooms, firm and picked to perfection, are available. *New York Herald-Tribune*, quoted by AMI's Mushroom News, June/58.

At the 1958 Royal Show at Bristol, R. H. Filmer Ltd., of Chatham, Kent, displayed entirely new designs including a **mushroom box,** highly resistant to moisture, and a prepack tomato tray which showed the contents to the best advantage. *Produce Packaging*, July/58.

A range of waxed board **punnets** designed by J. Dring Ltd., The Airport, Portsmouth, for use with cellulose film covers is another departure from the traditional wood veneer container.
Packaging News, June/58.

Two quite new additions to their range of **spraying and dusting equipment,** each easily carried and operated by one man, are now introduced by Drake and Fletcher Ltd., Maidstone, Kent. They are known respectively as the " MAMBA " shoulder mounted mist-blower/sprayer (£75) and the " MDG " motorised dust gun (£37 10s. 0d.)
Farm Implement and Machinery Review, July 1/58.

Giving instances of reckless indifference displayed by **British Railways** station staffs, F. E. M. Praill writes: " One of the best I've heard, on the most reliable of information, concerned some mushrooms. A box-like container was built inside the truck with some of the chips, and the remainder were first tossed in the centre anyhow until it was filled . . . I cannot understand why pressure is not brought to bear to make it imperative that highly perishable food crops are carried in air-conditioned vans, as in other countries".
One-page article in *Commercial Grower*, July 18/58.

The Tomato Board's plan to stop rock-bottom prices by buying **glut produce** off the market—to buy low-grade, unsold tomatoes and keep up the prices—is not likely to be working this season. I understand that one of the difficulties is the legal definition of low-grade tomatoes. *Grower*, July 12/58.

A new system of **automatic watering** developed at Wrest Park employs a much simplified technique in which the electronic leaf is replaced by a sensitive ceramic pot. This operates a vacuum switch, which in turn operates the water supply. *Grower*, July 12/58.

Several commercial rose-growing greenhouses were found to have beds where roses were growing poorly; the soil was found to be heavily infested with the mycelium of the fungus *Lepiota morgani*. The mushroom spawn **nematode** (*Ditylenchus* sp.) is known to feed on the mycelium of the commercial mushroom, and when inoculated on a large number of seed plants it does not multiply or cause any detrimental effects; therefore it was felt that possibly this nematode might also feed on the mycelium of this rose-bed fungus. The nematode failed to survive on cultures of *L. morgani*, and it was concluded that biological control by this fungus was not feasible.

A. F. Schindler in *U.S. Plant Disease Reporter*, May 15/58.

Over the past few years, with the growth of **women's papers**, the trade has very wisely extended invitations to women editors, journalists and cookery experts to come and see how the wheels go round. I believe the mushroom boys can take the credit for starting this idea.

Bill Sandford in *Fruit Trades' Journal*, July 5/58.

The Government is to pay more towards the cost of **nitrogen** fertilizers, as from 1st July. The rates for phosphates remain unchanged.

Grower, July 12/58.

SHILLING A QUARTER—MUSH!

When mushrooms have been averaging less than half-a-crown in the wholesale markets, there has been to my knowledge no attempt by the retailers to help us through a real crisis by bringing their prices down to the shilling-a-quarter line at which sales could be doubled. But would the housewife *really* buy twice as many mushrooms if the retail price were lowered?

F. C. Atkins in *Grower*, July 26/58.

Possibly the housewife would not buy twice as many mushrooms if the price were lowered, but twice as many housewives might buy, thus achieving the same desirable result. The marked decline in demand for mushrooms priced in excess of 1s. a quarter is, regrettably, well known to the distributive trade.

A. H. Leeney in *Grower*, August 2/58.

The retail trade has done nothing to help by reducing the price to the shopper; and it is no doubt only human nature to continue to charge 1s. 6d. or 1s. 3d. to a known range of customers when your buying price offers you an extra tanner of profit. Human nature, but unthinking human nature—the kind that leads to all the messes we have ever known.

Grower, August 9/58.

The advantages of **peat** as a potting medium are: good structure, low pH value, no sterilization needed, better utilization of plant nutrients as there is no fixing within the soil solution, and less work because it

does not dry out quickly. The disadvantages are: watering must be done very carefully during the winter owing to its high moisture-holding capacity, plants become hungry because there is no reserve of nutrients as in soil, and it is not possible to use organic fertilizers as there are no bacteria to make them available to the plants.

D. Woollett & R. Neiman in *Grower*, June 28/58.

Soil surface sprays of 1% and 1·5% of a water-soluble, hydrogenated fish oil, with anti-fungal activity, reduced the number of living **nematodes** (*Radopholus similis*) by about 90—92%.

G. Renninger and B. Sokoloff in *Citrus Industry*, 38 (12), 1957.

An evaporative **cooling** method, employing aspen excelsior padding and exhaust fans, was effective in reducing greenhouse summer temperatures 10 to 16° F. below prevailing outside temperatures and 17 to 21° F. below normal greenhouse temperatures.

W. J. Carpenter & W. W. Willis in *Proceedings of the American Society of Horticultural Science* (70) 1957.

Notes on the construction of a plant **environment control** installation with three chambers, each 10 ft. 6 in. × 7 ft. × 6 ft. 6 in. high, are given by Pressed Steel Co. Ltd., of Cowley.

Published by *Welsh Plant Breeding Station, Aberystwyth*, 1957.

Latest addition to the range of Kwikway **Trukbins** is a model designed to hold a number of trays 3 ft. long by 1 ft. 10 in. wide. It can be supplied for total working loads up to 10 cwt. The bin can be pushed or pulled by means of a two-wheel detachable bogie. Models to suit customer's existing trays can be supplied by Tansley Bros. Ltd., Standard Works, Mill Lane, Kidderminster, Worcs.

Industrial Equipment News, June/58.

Pyrethrum as an insecticide and larvacide has serious disadvantages, being less persistent than DDT, BHC and other insecticides of the same type, and less stable in daylight. Pyrethrins, stabilized and synergized by piperonyl butoxide, may well be free from those disadvantages . . . From laboratory experiments the Cooper Technical Bureau have evidence that cattle dips containing DDT which have become contaminated with mud may lose approximately 50% of their biological efficiency within a short time of preparation.

J. P. Brooke in *Annals of Applied Biology*, 46 (2), June/58.

" Some aspects of the casing layer in relation to fruiting of the cultivated mushroom ", by P. B. Flegg; " Mushroom diseases ", by Doreen G. Gandy; and " Mushroom Insects ", by Dr. N. W. Hussey, occupy 12, 5 and 6 pages respectively of the latest Report from **Littlehampton.** *Glasshouse Crops Research Institute Report* for 1956.

References:

Agriculture, H.M.S.O., York House, Kingsway, London, W.C.2.
Agricultural & Horticultural Engineering Abstracts, National Institute of Agricultural Engineering, Wrest Park, Silsoe, Beds.
AMI's *Mushroom News*, 20 West State Street, Avondale, Pennsylvania, U.S.A.
Annals of Applied Biology, Cambridge University Press, Bentley House, 200 Euston Road, London, N.W.1.
B. & G. Review, 27 St. James Street, Covent Garden Market, London, W.C.2.

Continued on page 375

The CULVERWELL Manure Turner

FOR MUSHROOM GROWERS

•

PETROL *or* ELECTRIC

•

EXTREMELY MOBILE

•

£225
Ex Works

The small machine with the BIG turnover

Bruises and aerates–does not shred. CAN BE USED FOR ALL TURNINGS. 3 men handle 25/50 tons per day. Waters as it turns. Stacks up to 5 feet. By using the CULVERWELL MANURE TURNER throughout the whole composting process, the work is reduced to the minimum, time taken is shorter with improved results.

Will pass through a door 2' 10" × 5' 10" with the detachable wheels removed

E.O. CULVERWELL Ltd.

MALLING WORKS LEWES · SUSSEX

Telephone **LEWES 637** (5 LINES)

PUBLICITY PLANS FOR 1959

Proposed Television Experiment

If plans approved by the MGA Executive Committee mature, following recommendations by the Publicity Committee, among the publicity efforts in 1959 will be a television campaign based on the Birmingham area.

The Birmingham area of I.T.V., which embraces places like Nottingham, Rugby, Leicester, Coventry and so on, to Bakewell in the North and Cheltenham in the South, Market Harborough in the East and Atcham (Shropshire) in the West, is considered an ideal area for measuring the impact of television advertising. In this midland region about one million homes have I.T.V., and the experts estimate that there is a maximum potential adult audience of nearly 3 million.

Over the years Birmingham has established itself as an excellent market for fresh mushrooms, served by growers from both the North and the South and this established fact commended itself to the Publicity Committee when considering the matter of television advertising.

As plans are at the moment there will be a simple type of film lasting seven seconds with five seconds of sound. It is proposed, some time between April and the end of August, to have four advertising spots per week for a total period of 14 weeks. A simple message, put over strongly and at regular intervals will, it is thought, extract the maximum amount of publicity for fresh mushrooms. Messrs. A. G. Street & Co. Ltd., London, who handle MGA advertising, are to arrange this television programme which, it is estimated, will cost nearly £4,000.

Other publicity plans include the continuance of the publicity paper bag scheme, which so far has sold 16 million bags, special Press advertising, exhibitions, the production of a special recipe folder for Local Authorities concerned with the feeding of large numbers of people, printing of other recipes designed for wider distribution, administration and public relations. On the subject of Public Relations the MGA is to employ a young woman to deal specially with this important branch of publicity. She will be based at Agriculture House and will make full use of the NFU's Information Services.

Outside the proposed television advertising, these other activities will cost in the region of a further £4,000, making a total expenditure on publicity in 1959 of about £8,000.

Whether these plans will materialise depends solely on the success or otherwise of the MGA's recent appeal for increased publicity contributions to which about 70% of the Grower Members have already agreed.

If you are one of those who have not yet agreed to support this MGA campaign for increased publicity subscriptions, agreed to by all but one of the members who attended the annual general meeting, please give the matter your close consideration right away, sign the form and return it to the Secretary.

99·9 COMPOST MAKER

Is a **BLOOD BASED** Activator and the cost of implementing your racing stable manure works out at approximately

7/- PER TON

Capelle Straw can be broken down effectively by using **BRADFORD SPECIAL MIX.** The fine **SOLUBLE BLOOD POWDER** used in this activator has a solubility of 94% and is an ideal additive when dealing with this tough straw. Approx. cost of treating 1 ton is **8/-.**

A good spawn run does not always mean a good crop but the possibility is greatly improved if a **BLOOD BASED** Activator is used.

MRA No. 1 still available in limited quantities.

FOR PROMPT DELIVERY

BRADFORD FERTILIZER CO. LTD.

Whitefield Place, Girlington, Bradford 8

Call and have a chat with our Representative on STAND No. 8 at Bournemouth

British Engineering International, Dorset House, Stamford Street, London, S.E.1.
Commercial Grower, 154 Fleet Street, London, E.C.4.
Darlington's *Mushroom News*, Southcourt Road, Worthing, Sussex, England.
Digest of Equipment, 3 Cranston Drive, East Didsbury, Manchester 20.
Farm Implement Machinery Review, 9 The Broadway, Woodford Green, Essex.
Food Investigation, H.M.S.O., York House, Kingsway, London, W.C.2.
Fruit Trades' Journal, 6/7 Gough Square, Fleet Street, London, E.C.
Grower, 49 Doughty Street, London, W.C.1.
Horticultural Abstracts, Commonwealth Agricultural Bureaux, Farnham Royal.
Industrial Equipment News, 33 Tothill Street, London, S.W.1.
Nurseryman, Seedsman & Glasshouse Grower, 62 Doughty Street, London, W.C.1.
Packaged Food Selling, 110 Fleet Street, London, E.C.4.
Produce Packaging, Agriculture House, Knightsbridge, London, S.W.1.
Safety Equipment & Industrial Clothing, 9 Gough Square, Fleet Street, London, E.C.4.
Transactions of the British Mycological Society, Cambridge University Press, Bentley House, 200 Euston Road, London, N.W.1.
U.S. Plant Disease Reporter, Plant Industry Station, Beltsville, Maryland, U.S.A.

PENSION SCHEME FOR FARM AND HORTICULTURAL WORKERS

NFU branches in England and Scotland are considering a voluntary pension scheme for farm and horticultural workers and the suggestion is that workers and employers should each contribute at the rate of 2/6d. per week as a minimum but, by mutual agreement, both sides could increase the contribution rate and thus increase the pension. On the basis of 2/6d. per week a worker joining at 21 would get a pension of £175 per year at the age of 65 and a worker joining at 40 would rate for a pension of £57 11s. 0d.

SMALL ADVERTISEMENTS *Cont'd from page 384*

WILL YOU EMPLOY ME? Able bodied young man, aged 22, single, seeks employment on a Mushroom Farm. Public School education. Will go anywhere at any time. Very keen to enter the industry as soon as possible. J. SOUTHERST, 24 Worsley Road, Worsley, Manchester.

FOR SALE as a whole or by lots in AIX EN PROVENCE 50,000m² of mushroom beds divided into four caves with a tunnel height of 2m 50. ventilation by diesel engines, all the tunnels have running water under pressure, ground cemented 2,400 m, brick partitions extend 800 m, covered ventilated passages storing manure, moderate regulated temperature of 12° to 16° C. humidity of 75 to 90°. Assured nearby mediterranean coast outflow. Moreover these are cement tunnels entirely divided up covering an area of about 9 hectares. This holding is unique within the radius of Aix en Provence and it is bound to interest mushroom growers wishing to start up in France. All tunnels are washed, equipped with running water under pressure, and disinfectant, and have recently been repaired. Lombrage & Cie, Domaine d'Estoublon, Fontvielle, (B-du-Rh), France.

MANAGER of Large Mushroom Plant seeks change. Fully experienced in all aspects of growing, mechanisation and administration. Would be particularly interested in farm planning development. Box No. 27.

FARM WALK AND AREA MEETING
FRIDAY, 17th OCTOBER, 2.30 p.m.
Mereside Mushroom Company
Staining, Blackpool
ALL MEMBERS WELCOME

FANCY THAT!

Sent to Coventry: In a dispatch from Tokyo on 11th July, reported next day in the *Manchester Guardian*, the Japanese Supreme Court has created an important precedent and struck a blow at lingering feudalism in rural areas of the country by ruling that the ancient custom of murahachibu, or village ostracism, constitutes an act of violence punishable under existing law.

The decision was handed down in a six-year old dispute between villagers in Hogo prefecture over mushroom-gathering rights. Five families declined to accept the dictate of the village leaders whereupon a "village ostracism" campaign, the traditional rural weapon for bringing dissidents into line, was organised against them. Leaders of the local forestry co-operative withheld dividends due to the obstinate five and ordered members of the community to break all social ties; no one was to speak to the men, women and even children thus "sent to Coventry." The five families declined to be intimidated however, and took the issue to court, claiming that ostracism constituted a violation of their human rights.

What next? Will you please let me know your charges for television and wireless rentals? Letter received by the MGA Secretary from a lady in Wales.

High Pressure: Walking to Marnhull Flower Show Mr. W. H. Godfrey picked two mushrooms which were growing through the tarmac road surface.

MUSHROOM CALYPSO

We remind you of things you ought to remember
In this Mushroom Calypso for September;
Being wise, you'll pack your trunk, no doubt,
As this Autumn month is rolling out,
For growers' cars go rolling South
On the 1st of October to Bournemouth;
The date is one you can't mistake,
The venue ideal for a holiday break;
So make arrangements and check your booking,
For you (and you! and you!) we'll all be looking.
Yes! we remind you of things you ought to remember
In this Mushroom Calypso for September. F.P.

LITERATURE LIST

		Price s.	d.	*Postage* s.	d.
"Commercial Mushroom Growing"	(Pinkerton)	21	0	1	6
"Mushroom Growing To-day" ..	(Atkins)	21	0	1	6
"The Fred Atkins Alphabet" ..	(Atkins)	5	0		
"Major Diseases and Competitors of the Cultivated White Mushroom"	(Atkins)	5	0		
"Tray System in Great Britain" ..	(Atkins)	2	6		
"Mushroom Science II" ..	(Edwards—Editor)	12	0		9
"Mushroom Science III"		30	0	1	0
"Southport, 1957"	(Atkins—Editor)	10	0		
"The Improvement of Composts"	(Rasmussen)	5	0		

Mushroom Research Association Ltd.

Report for the years 1946/48	10	0			
Report for the year 1949	5	0			
Report for the year 1950	5	0			
Report for the year 1951	5	0			
Report for the year 1952	5	0			
Report for the year 1953	5	0			
Report for the year 1954 (Final)	5	0			

All the above are available from :—The Secretary, Mushroom Growers' Association Agriculture House, Knightsbridge, S.W.1.

1958 PUBLICITY FUND CONTRIBUTORS

Salesmen:—	£	s.	d.
Geo. Jackson & Co. Ltd., Smithfield Market, Birmingham	50	0	0
J. Stratton Ltd., Spitalfields Market, London, S.E.1.	5	5	0
T. J. Poupart Ltd., Covent Garden, London, W.C.	105	0	0
Francis Nicholls Ltd., Smithfield Market, Birmingham	157	10	0
Reuben Levy Ltd., 88 Spitalfields Market, London, S.E.1	5	8	1
C. W. Tooley & Son Ltd., Nottingham	2	2	0
Wm. Morgan & Co. Ltd., Custom House Street, Cardiff	10	10	0
Jackson & Lakin Ltd., Nottingham	5	3	8
R. E. Jenkinson Ltd., Covent Garden Market, W.C.2	105	0	0
C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield	11	16	5
Dan Wuille & Co. Ltd., Covent Garden Market, W.C.2.	75	0	0
Ernest White Ltd., Kirkgate Market, Leeds	5	0	0
Ed. H. Lewis & Sons Ltd., Covent Garden Market, W.C.2	5	5	0
A. Williamson (19) Ltd., Smithfield Market, Birmingham	5	5	0
C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield	15	5	5
P. & T. Fitzpatrick, 22 Queen Square, Liverpool 1	5	5	0
James Blackburn (Manchester) Ltd., Smithfield Market, Manchester.	10	10	0
G. E. Leatherland Ltd., St. Andrew's Street, Newcastle-on-Tyne	58	7	10
Herbert Hitchcock & Son Ltd., Boro' Market, S.E.1	5	5	0
J. Collingridge Ltd., Covent Garden Market, W.C.2	25	0	0
William Hancock Ltd., 16 Humber Street, Hull	2	2	0

***Spawn Merchants:—**

Monlough Food Production Co. Ltd., Ballygowan, Belfast.
S. A. F. Sampson Ltd., Oving, Chichester, Sussex.
Pinkerton's Scottish Mushroom Laboratories, Millerston, Glasgow.
H. Mount & Sons Ltd., Littlebourne, Canterbury, Kent.
W. Darlington & Sons Ltd., Southcourt Road, Worthing, Sussex.
Geo. Monro Ltd., Hertford Road, Waltham Cross, Herts.

*Amounts collected by spawn merchants are not for publication.

Sundriesmen:—	£	s.	d.
Shirley Organics Ltd., Vicarage Wharf, Battersea, S.W.11 (activators)	25	0	0
D. C. Bushell & Co. Ltd., Sandhurst, Camberley, Surrey (manure merchants)	10	10	0
Thos. Elliott Ltd., Eagle Mills, New Church Road, S.E.5 (manure, activators, sundries)	10	10	0
Stable Manures Ltd., Newmarket and Worthing	40	0	0
Arthur Coomer Ltd., Grove Road, Farlington, Portsmouth	10	10	0
T. A. Smith, of G. W. Smith & Son (Thorpe) Ltd., Thorpe, Wakefield.	2	2	0

LAST MONTH'S PUBLICITY CONTRIBUTIONS

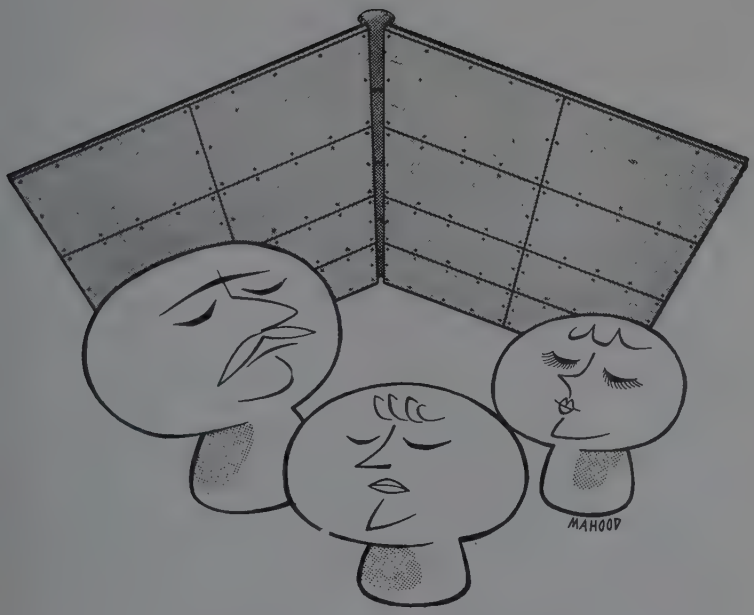
In presenting last month's list of contributors to the MGA Publicity Fund the Publicity Committee urge all members to pay particular attention to the list, also published on this page, of those firms who continue to support this MGA Publicity Scheme. The Committee do this in the firm belief that publicity is of the greatest benefit to the Mushroom Industry as a whole and, as all sections of the industry benefit from increased sales, it is only right and proper that all sections of the industry should contribute.

Salesmen:—	£	s.	d.
Reuben Levy Ltd., 88 Spitalfields Market, London, S.E.1	3	5	2
†C. Snowdon & Co. Ltd., Castlefolds Market, Sheffield	3	13	2

***Spawn Merchants:—**

†Monlough Food Production Co. Ltd., Ballygowan, Belfast.

*Amounts collected by Spawn Merchants are not for publication
†Previous contributions already acknowledged



strictly mushrooms only

For a fire-proof, fool-proof lining for mushroom sheds there has never been anything like ASBESTOLUX, the lightweight asbestos insulation board. For while mushrooms thrive under its genial protection, ASBESTOLUX will not itself harbour any kind of rot, insect or vermin whatsoever. It needs no painting, lasts indefinitely, is undeterred by steam and moisture, is very easy to cut and fix . . . and do mushrooms love it! Tempted by the unprecedented warmth, they pop up in their thousands just to have a look!

CAPE

ASBESTOLUX

non-combustible asbestos insulation board

Supplied in boards 4′, 6′, 8′, 9′ and 10′ long, 2′ or 4′ wide, in ¼″, ⅜″, ½″ thicknesses.

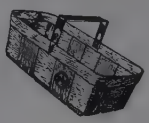
Full details from the sole manufacturers:

CAPE BUILDING PRODUCTS LIMITED Cowley Bridge Works,
Uxbridge, Middlesex. Tel: Uxbridge 4313
Glasgow: Eagle Buildings, 217 Bothwell Street, Glasgow, C.2. Tel: Central 2175
Manchester: Floor D, National Buildings, St. Mary's Parsonage, Manchester 3. Tel: Blackfriars 7757
Birmingham: 11 Waterloo Street, Birmingham 2. Tel: Midland 6565-6-7
Newcastle: 19 & 20 Exchange Buildings, Newcastle-upon-Tyne. Tel: Newcastle 20488

ATLAS

VENEER CHIP BASKETS AND PUNNETS

The finest packing medium for retaining the freshness of Mushrooms



We shall be pleased to meet you on our Stand (No. 7) at the Mushroom Industry Exhibition at Bournemouth, 1st/2nd October, 1958

●

THE ATLAS BASKET COMPANY LIMITED

ATLAS WORKS

HARPENDEN **HERTS.**

Telephone : Harpenden 3121 Telegrams : "Atlas, Harpenden"

What does this Act mean to **YOU?**

It is very important that you know exactly how your liability as an employer is affected by the AGRICULTURE (SAFETY, HEALTH & WELFARE PROVISIONS) ACT, 1956.

Your responsibilities which, as an employer of labour have always been considerable, are already greater because of regulations made under the Act. These regulations (and there are more to come) impose upon you many statutory obligations. There is no limit to the amount of damages which can be awarded to an employee who successfully proves that his injuries resulted from a breach of these duties.

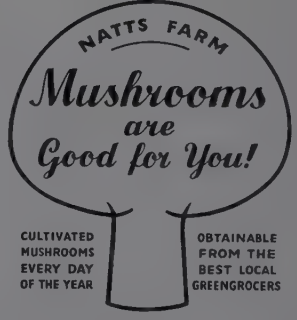
In your own interests make sure you are adequately insured. Have a word with your N.F.U. secretary now and ask him for details of the "N.F.U. Mutual" Third Party and Road Risks policy.

Don't wait until it is too late.

N.F.U. MUTUAL

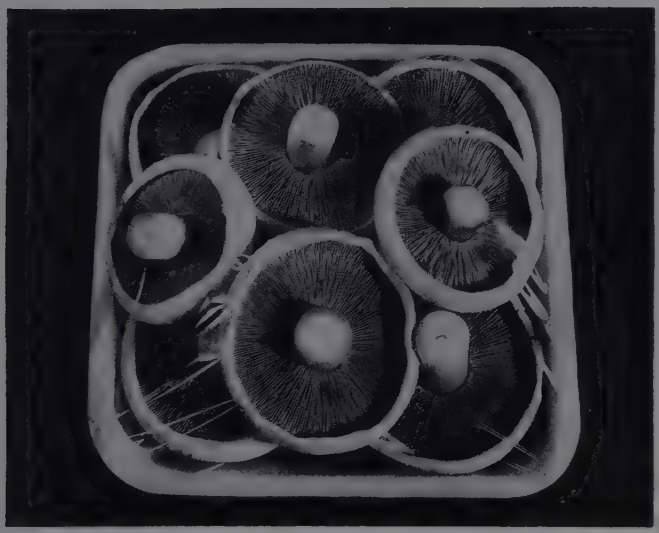
[NATIONAL FARMERS UNION MUTUAL INSURANCE SOCIETY LTD.

Head Office : STRATFORD-ON-AVON


NATTS FARM
Mushrooms are Good for You!
CULTIVATED MUSHROOMS EVERY DAY OF THE YEAR
OBTAINABLE FROM THE BEST LOCAL GREENGROCERS

Many members find that local publicity is a great aid to direct-from-farm-to-retailer sales. This is an example put out by Messrs. J. E. R. Simons Ltd., of Harlow, Essex, suppliers of the well-known Mount Spawn.

THE GREATEST SALES AID FOR MUSHROOMS
is the HARTMANN pre-pack



Every modern Food Store will sell pre-packed Mushrooms because housewives will more readily buy Mushrooms in $\frac{1}{4}$-lb. or $\frac{1}{2}$-lb. prepacks.

Make Mushrooms more popular ***and within the easy reach of all*** by prepacking **"THE HARTMANN WAY"**—the greatest sales aid for Mushrooms.

Consult

HARTMANN

THE HARTMANN FIBRE CO. LTD.
City Wall House, Finsbury Square, London, E.C.2
Telephone: Monarch 1383/5

(1) COMPOST + SPAWN = ?
(2) TESTED COMPOST + SPAWN = GOOD CROPS
(3) TESTING COMPOST IS SIMPLE AND REQUIRES NO SPECIAL EXPERIENCE

B.D.H.
BARIUM SULPHATE SOIL TESTING OUTFIT
price 70/-

A B.D.H. Soil Testing Outfit enables you to make reliable *p*H tests quickly and easily, even though previously inexperienced in the method.

From all Chemists and Sundriesmen

Literature is available from :— B.D.H. LABORATORY CHEMICALS GROUP

THE BRITISH DRUG HOUSES LTD.
POOLE DORSET
STO/LC/551

GOUGH'S

MUSHROOM PACKS and BASKETS

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Visit us on STAND 20 at the Exhibition

•

If you can't . . .
Then write us and we will post you samples and prices

•

F. GOUGH & SON LTD., Fishergate, Norwich
TELEPHONE NORWICH 25221

BUSHELL

for

Good Measure

STABLE MANURE of the FINEST QUALITY

• •

Messrs. D. C. BUSHELL & Co. Ltd., will be pleased to see their many friends at Stand No. 2, at the Mushroom Industry Exhibition, Bournemouth, 1st—2nd October

• •

D. C. BUSHELL & CO. LTD.

Sandhurst Corn & Grist Mills

SANDHURST, CAMBERLEY, SURREY

'Phone : Yately 2241

SMALL ADVERTISEMENTS 4d. a word

J. E. R. SIMONS LIMITED specialise in all requirements for commercial mushroom growing. **J. E. R. SIMONS LTD.** advise on culture, packaging and marketing. **WE SUPPLY** Gypsum and Peat, Insecticides, Santobrite for dipping trays and timber, Mushroom Trays, Comporotor Manure Turner, Thermometers, Hose, Hose Fittings and Clips, Chip Baskets and Lining Papers, Rubber Bands, MRA Activators, Paper Bags for used compost, Bag Ties and Tools, special hard service Electric Bulbs, Roofing Felt and Roof Ventilators, Aluminium Paints and Bitumen High Gloss Paint, Aprons and Leggings, Polythene Sheets, Cleaning Brushes and Weighing Machines.

PURE DRIED GROUND POULTRY MANURE. This pure, natural organic is regularly used by prominent mushroom growing firms. It represents an invaluable *organic* activator for stable manure. Finely and evenly ground, it is convenient and clean to handle and being packed in ½ cwt. sacks, the weight you receive is *guaranteed.* Sample and prices (which vary according to the distance for carriage from our Works) on application. Sole Producers:—THE HAMPSHIRE GUANO CO. LTD., SOBERTON, SOUTHAMPTON. (Est. 1937). Manufacturers of "Gunos" (Regd.) Brand Fertilisers.

PORTABLE BOILERS for Peak Heating and/or Soil Sterilizing, with equipment to suit users. REED BROS. (Engineering) LTD., Replant Works, Woolwich Industrial Estate, London, S.E. 18.

CHALK AND CARBONATE OF LIME. Best quality Ground Chalk and Derbyshire Limestone supplied in bags; also broken chalk and limestone. DERBYSHIRE STONE LIMITED, Matlock. Telephone: 741.

FOR SALE. Mushroom Farm 7,500 sq. ft. West Sussex. With modern bungalow. Room for expansion. Box No. 18.

NOTTINGHAM Company require mushrooms urgently. Write for managing director to visit you. Box No. 5.

SHEFFIELD WHOLESALER requires regular consignments of good quality mushrooms. Prompt returns and personal attention ensured. Please write to Box No. 26.

FOR SALE: Sectional Hotwater Boilers, reconditioned, variety makes and sizes. Also Vertical Steam Boilers for peak-heating, etc. Screwed Steel Piping ½" to 4", black and galvanised. 4" Cast Iron Hotwater Piping. Several large galvanised Tanks up to 2,800 gallons. Also Gravity Roller Conveyor 14" and 18" wide. A. H. KIMMINS & SONS LTD., Lyndhurst Road, Worthing.

TO IMPROVE by practicing my knowledge of the English language, 27 years old Portuguese student, with enough experience on mushroom farm work, will appreciate if some British mushroom grower could offer me employment during 4 to 5 months. I will pay my trip expenses and accept a hand man salary.
Reply to Fernando Casimiro, Rua Augusta 146, Lisboa, Portugal.

31 YEAR OLD GARDENER, German, horticulture student for 3 years, requires a position on a U.K. mushroom farm for 6 months to a year: KLAUS SOMMERFELDT, Berlin-W 30, Stübbenstrasse 5.

CLINKER Blocks are cheap, and simple to use. Large or small quantities from COOPERS, Builders' Merchants, Ashford and Canterbury.

FOLLOWING the decease of the owner there falls vacant a Mushroom Farm of approximately 12,000 sq. ft. in South Staffordshire area. All Houses are of Brick and Asbestos construction in Steel frames : running water in each house, electric light, fully automatic oil-fired boiler ; live steam for peak heat, packing shed, offices, equipment etc. For sale or Lease. House to rent. Box No. 28.

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Shirley Organics Limited are pleased to announce a new activator **specifically** produced for making synthetic composts for mushroom cultivation. It comes as a result of a very wide experience in this field of culture and following many practical tests. It will be known as **SHIRLEY—M.S.** to distinguish it from the widely used SHIRLEY M, which will be continued for use as an additive to stable manure and for use, under certain growing conditions, as a synthetic. We should like to send you full particulars of this proven activator. The price of **SHIRLEY—M.S.** may surprise you as it is most economical to use.

Our technical representative would be pleased to call on you.

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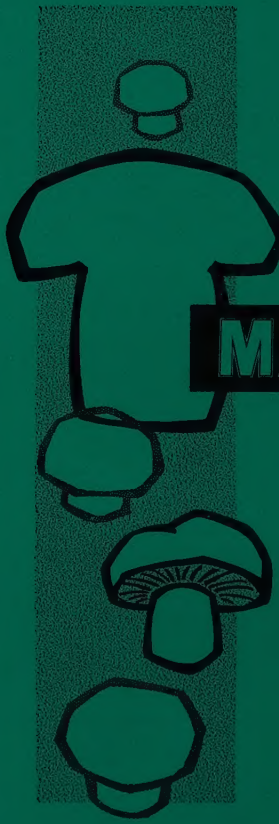
SHIRLEY ORGANICS LTD.

VICARAGE WHARF

BATTERSEA - S.W.11

'PHONE: BATTERSEA 1016



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